



1995-96 KIRIS OPEN-RESPONSE ITEM SCORING WORKSHEET

Grade 8 — Mathematics Question 5

The academic expectations addressed by this item include:

1.5 - 1.9 Students use mathematical ideas and procedures to communicate, reason, and solve problems.

2.9 Students understand space and dimensionality concepts and use them appropriately and accurately.

The core content assessed by this item includes:

Geometry/Measurement Concept

- Students should understand two-dimensional shapes including circles, regular polygons, special quadrilaterals, and special triangles.

Skills

- Students should be able to: use appropriate tools and strategies to find measures of both regular and irregular shapes; to use formulas to find measurements of two-dimensional shapes.

Algebraic Ideas Concept

- Students should understand rectangular (Cartesian) coordinate system/grid.

5. Triangle ABC

- Plot the following three points on the grid provided in your Student Response Booklet: A(-1,6), B(2,6), C(2,2). Connect points A, B, and C.
- Determine the area of triangle ABC. Explain or show how you found the area.
- Determine the perimeter of triangle ABC. Explain or show how you found the perimeter.

BE SURE TO LABEL YOUR RESPONSES (a), (b), AND (c).

SCORING GUIDE

Score	Description
4	Student plots and connects points ABC accurately (see diagram below), determines correct area (6) and correct perimeter (12) - complete solution strategy or verbal explanation given with reference to an applicable formula (e.g., area, distance between points, pythagorean theorem).
3	Student plots points correctly and determines correct area <u>and</u> correct perimeter - incomplete solution strategy or weak explanations for parts b and/or c.
2	Student plots points correctly and determines correct area or correct perimeter - work may be incomplete.
1	Student plots points correctly, 2 or 3 points plotted correctly, OR Student determines correct area or perimeter, no work shown.
0	Response is incorrect or irrelevant.
Blank	Blank/no response.

MEASUREMENTS

Length:

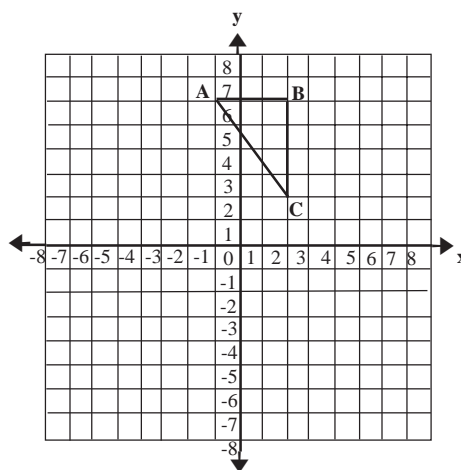
AB 1.5 to 1.6 cm

BC 2.0 to 2.1 cm

AC 2.5 to 2.7 cm

AREA: 1.5 to 1.68 cm²

PERIMETER: 6.0 to 6.4 cm



Correct perimeter and
area for incorrect
figure can earn 2.

Correct perimeter or
area for incorrect
figure can earn 1.

Note: Original diagram is reduced in size on these open-response item scoring worksheets.



KIRIS ASSESSMENT ANNOTATED RESPONSE GRADE 8 MATHEMATICS

Sample 4-Point Response of Student Work

Student provides the formula for finding the area of a triangle and uses the formula, with measurement of the base and height derived from the grid, to calculate the area of the triangle.

To find the area of this triangle I have to first have a formula. $A = \frac{1}{2} \times b \times h$.

With this formula I can find the area

$$A = \frac{1}{2} \times b \times h$$

$$A = \frac{1}{2} \times (3) \times (4)$$

$$A = \frac{1}{2} \times (12)$$

$$A = 6 \text{ sq. u}$$

The area of this triangle is 6 square units. To find the perimeter, the distance around the object I also have to have a formula, $P = s + s + s$

I cannot find out how many units the third side is until I use the Pythagorean Theorem to find the hypotenuse. To do this I have to use my formula

$$A^2 + B^2 = C^2$$

$$3^2 + 4^2 = C^2$$

$$9 + 16 = C^2$$

$$25 = C^2$$

$$\sqrt{25} = C$$

$$5 = C$$

(note: Pythagorean Theorem is listed on reference sheet)

The amount of the third side is 5 units. Now I can find the perimeter.

$$P = s + s + s$$

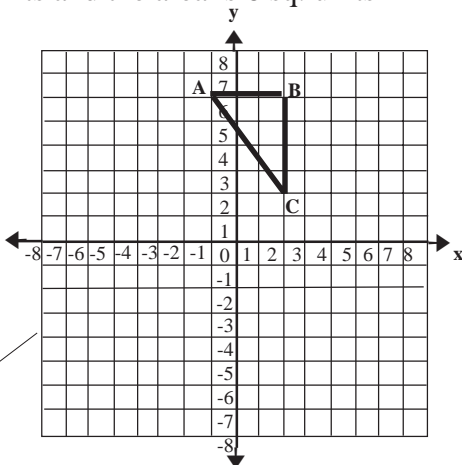
$$P = 3 + 4 + 5$$

$$P = 12 \text{ units}$$

The perimeter is 12 units and the area is 6 sq. units

Student's formula for perimeter of triangle uses s for each of the 3 sides.

Student correctly plots the points on the cartesian plane in the grid of the student response book, labels the points and then draws triangle ABC.



In part c, the student uses the Pythagorean Theorem to determine the measure of the third side of the right triangle, and then uses that measure to calculate the perimeter of the triangle.



KIRIS ASSESSMENT ANNOTATED RESPONSE

GRADE 8 MATHEMATICS

Sample 3-Point Response of Student Work

Student does not explain how the length of the third side of the triangle was determined.

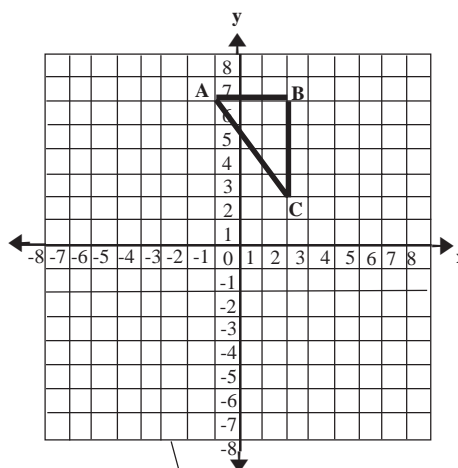
To find the Area I will have to multiply the Base to the height then multiply that answer by $\frac{1}{2}$

$$\begin{array}{r} 12 \\ \times .5 \\ \hline 6.0 \end{array}$$

$$\begin{array}{l} \text{Base} = 3 \text{ inches} \\ \text{height} = \underline{4 \text{ inches}} \\ 12 \end{array}$$

so the Area is 6 inches
To find the perimeter I would have to add the length, width, and Base all together.

$$\begin{array}{r} 4 \\ + 3 \\ \hline 7 \\ + 5 \\ \hline 12 \text{ inches around} \end{array}$$



Area and perimeter are correctly calculated, but explanations supporting the work are minimal; inches are inserted as lengths with no explanation, area is reported in linear units.

Student correctly plots the points and draws triangle ABC.



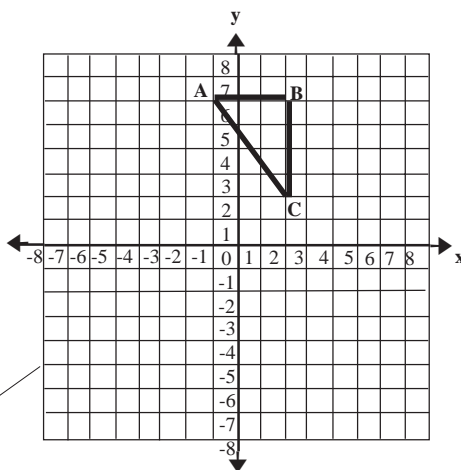
KIRIS ASSESSMENT ANNOTATED RESPONSE GRADE 8 MATHEMATICS

Sample 2-Point Response of Student Work

The perimeter is incorrect. The explanation of how the perimeter was determined, though incorrect, does support the answer given using just sides AB and BC.

The area is correctly calculated with some explanation of process.

The area of the triangle is 6 units. To get this I multiplied half of the base, 2, by the height, 3. The perimeter of distance around the triangle is 8 units. I added up all the blocks on the edge of the triangle to get this.



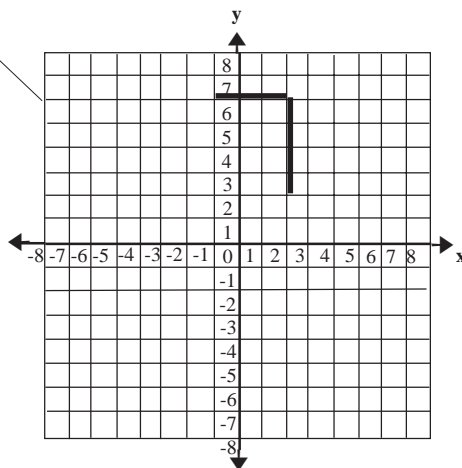
Student correctly plots the points and draws triangle ABC.

Sample 1-Point Response of Student Work

Student makes no attempt to calculate the area or the perimeter of the triangle.

Student plots (but does not label) points A, B, and C correctly but does not complete the drawing of the triangle.

- I have been asked to draw and label a set of coordinate axes on the grid.
- I have to determine the area of triangle ABC. I don't know!
- I have to now determine the perimeter of triangle ABC. I don't know.

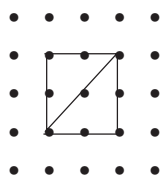


INSTRUCTIONAL STRATEGIES

Triangle ABC

Develop area of a triangle using geoboards

Area of triangle = $\frac{1}{2}$ area of rectangle



Practice graphing in a coordinate plane. Have students examine area and perimeter of geometric figures on geoboards and coordinate grids. Compare and contrast perimeters and areas, units and square units.

Experiment with finding length of sides of geometric figures, use ruler measurements to find diagonal lengths and common ratios to convert to unit length. Make a grid ruler to find unit length. Explore right triangles for Pythagorean relationships.

Use KIRIS-like open response questions in classroom instruction and assessment. Model strategies for explaining work to fellow mathematicians. Model and have students develop and use scoring guides with open response items. Encourage students to explore highlighting and underlining strategies as organizers, stressing that only evidence found in Student Response Book is scored.

Infuse lessons with the use of a variety of instructional approaches and strategies:

- use mathematical tools, manipulatives, hands on activities, cooperative group work, higher order thinking skills, video tapes, multiple intelligences approaches, mappings, graphic organizers, etc.

Explore appropriate use of calculators, both as tools and instruments for checking work.

Have students experiment problem solving with use of reference sheet as provided.

REFERENCES

TRANSFORMATIONS Kentucky's Curriculum Framework

Academic Expectations 1.5-1.9 and 2.7 through 2.13

KDE's Core Content for Assessment

Mathematics, examine curriculum alignment from P through 12

KDE's web site at <http://www.kde.state.ky.us>

explore curriculum pages, examine units of study, etc.

Curriculum and Evaluation Standards for School Mathematics,

Professional Standards for Teaching Mathematics, Assessment

Standards for School Mathematics, and Addenda Series from NCTM.

Telephone: 703-620-9840, web site at <http://www.nctm.org>